THE MINERAL INDUSTRY OF GHANA

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The Republic of Ghana covers an area of 238,540 square kilometers (km^2) on the coast of West Africa and supported a population of about 20.6 million in 2003. Ghana was primarily an agricultural economy; this sector accounted for about one-third of the gross domestic product (GDP) and more than 50% of the labor force. Formal mining and quarrying accounted for approximately 25% of the GDP and about 10% of Government revenues and employed about 14,000 workers, or less than 1% of the labor force. Artisanal miners, which are locally known as "galamsey," may have accounted for an additional 100,000 people involved in diamond, gold, and industrial mineral exploitation, some of which was illegal. Ghana was the second leading gold producer in Africa after South Africa, the third leading African producer of aluminum metal and manganese ore, and a significant producer of bauxite and diamond. In addition, a number of industrial minerals, which included clays (kaolin), dimension stone, limestone, salt, sand and gravel, and silica sand, were produced on a small scale (Barning, 1997, p. 1).

The GDP, based on purchasing power parity for 2003, was $44.44 billion with an estimated real growth rate of 4.7% compared with 5.8% in 2002. GDP per capita was estimated to be $2,200. The inflation rate increased to 26.7% from 14.8% in 2002 (U.S. Central Intelligence Agency, 2004§[1]).

Government Policies and Programs

Legislation that affects mining and mineral exploration in Ghana includes the Minerals and Mining Law, 1986 (PNDCL 153), as amended by the Minerals and Mining (Amendment) Act, 1994 (Act 475); The Investment Promotion Act, 1994 (Act 478); the Additional Profits Tax Law, 1985 (PNDCL 122); the Minerals Commission Law, 1986 (PNDCL 154); the Minerals (Royalties) Regulations, 1987 (LI 1349), Environmental Protection Agency Act, 1994 (Act 490) and the Environmental Assessment Regulations, 1999, and as amended, 2002. The 1986 mining law had been instrumental in attracting more than $5 billion in foreign investment to the Ghanaian mining industry between 1986 and 2002. Act 475 reduced the 45% general mining corporate tax rate to 35%, which is the same as that imposed on other industries. The Petroleum (Exploration and Production) Law, 1984 (PNDCL 84), sets out the policy framework and describes the role of the Ministry of Mines and Energy, which regulates the industry. Ghana National Petroleum Corp. (GNPC), which is empowered to undertake petroleum exploration and production on behalf of the Government, is authorized to enter joint ventures and production-sharing agreements with commercial organizations; GNPC was established under the GNPC Law of 1983 (PNDCL 64). The regulation of artisanal gold mining is set forth in the Small-Scale Gold Mining Law, 1989 (PNDCL 218). The Precious Minerals Marketing Corporation Law, 1989 (PNDCL 219), set up the Precious Minerals Marketing Corporation (PMMC) to promote the development of small-scale gold and diamond mining in Ghana and to purchase the output of such mining, either directly or through licensed buyers. Concerned with the dropoff of investment in the mining sector since 1999, the Ministry of Mines prepared draft legislation to revise PNDCL 153 to enhance Ghana's international competitiveness; the legislation was submitted to Parliament in mid-2002.

The Ministry of Mines and Energy oversees all aspects of the Ghanaian mineral sector and is the grantor of mineral and energy exploration and mining leases. Within the Ministry, the Minerals Commission has responsibility for administering the Mining Act, recommending mineral policy, promoting mineral development, advising the Government on mineral matters, and serving as a liaison between industry and the Government. The Ghana Geological Survey Department conducts geologic studies, and the Mines Department has authority in mine safety matters. All mine accidents and other safety problems also must be reported to the Ghana Chamber of Mines, which is the private association of operating mining companies. The Chamber also provides information on Ghana's mining laws to the public and negotiates with the mine labor unions on behalf of its member companies.

During 2003, a debate was initiated on the amount and distribution of mining royalties. According to the International Monetary Fund (2004a§), "under Article 22 of the Minerals and Mining Law, mining companies are required to pay no less than 3% and, depending upon their profitability rate, up to 12% of their gross revenues as royalties." Twenty percent of the mining royalties go to fund a Minerals Development Fund. Half of the Development Fund supports the mining agencies, such as the Mines and Geological Survey Departments and the Minerals Commission. The other half of the Minerals Development Fund is transferred to the Office of the Administrator of Stool[2] (Chieftaincy) Lands to be distributed to the mining communities. The Office of the Administrator of Stool Lands retains 10% and distributes the remaining 90% to local authorities for intended use in repairing environmental damage and development projects in the mining communities. The stools of the mining areas receive 25%, the traditional authorities of the areas, 20%, and the District Assemblies within the area of authority of which the stool lands are situated, 55%. The IMF review noted that revenues are not always used to benefit the mining communities. The Minister of State for Finance and Economic Planning recommended that the amount of royalties that flow directly to the mining communities be increased from 9% to 30% (Coomson, 2003§).

[1]References that include a section mark (§) are found n the Internet References Cited section.

[2]The term "stool" refers to the carved wooden, or in the case of the Chief of the Ashanti Tribes, golden stool or seat that is the symbol of the chieftaincy. The traditional hierarchy of paramount, subregional, and village chiefs dictates distribution of revenues.

Production and Trade

Production of major mineral commodities is listed in table 1. Of the major mineral commodities, manganese production increased by about 33% during 2003; gold held steady; and aluminum, bauxite, and diamond production decreased by 86%, 28%, and 4%, respectively. The Volta Aluminum Co. Ltd. (Valco) aluminum smelter was closed in May after power restrictions reduced output to 20% of capacity. Modest fossil fuel production came from the Tano oilfields with production of about 8,200 barrels per day of oil. Natural gas was produced from the Tano North gasfield for the first time in 2003.

For 2003, the country had a $788 million merchandise trade deficit, which was based on total exports of $2,471 billion and total imports of $3,259 billion. The increased cost of imported petroleum products ($788 million) negated the increased commodity prices for cocoa and gold. The principal exports were gold ($830 million), cocoa ($818 million), and timber ($174 million) (International Monetary Fund, 2004b§).

Structure of the Mineral Industry

Through privatization programs during the 1990s, the Government greatly reduced its once-dominant stake in cement and gold companies. It has maintained a controlling interest in Ghana Consolidated Diamonds Ltd., Ghana National Petroleum Corporation, and state-run Tema Steel Co., although these were on a list for divestiture in 2004. As shown in table 2, most major mining activities are now privately owned and operated.

Commodity Review

Metals

Aluminum and Bauxite.—Valco's smelter at Tema Harbor was majority owned (90%) and operated by Kaiser Aluminum & Chemical Corp. (Kaiser) of the United States (a wholly owned subsidiary of Kaiser Aluminum Corp.). Valco had been struggling with fluctuating operating levels for several years and was operating only one out of five pot lines in early 2003. Power allocations from the Volta River Authority (VRA) have been restricted by droughts and low water levels in the Akosombo Dam. In May, Kaiser (which had applied for bankruptcy in U.S. Courts in 2002) closed the Valco plant, with a resulting production for the year of 16,000 metric tons (t) or about 9% of its capacity. In December, following negotiations between the Government, Kaiser, and the VRA (with whom Kaiser was committed to a power supply contract until 2017), Kaiser signed a memorandum of understanding to sell its stake in Valco to the Government. The agreement called for a sale price of between $35 million and $100 million and for the Government to assume all Kaiser's liabilities and obligations. The deal was expected to be completed by April 30, 2004 (Foster, 2003§; Kaiser Aluminum & Chemical Corp., 2003§). The Government planned to seek other foreign investors to keep the smelter open and possibly to develop domestic bauxite resources at Kibi and Nyinahin.

Ghana Bauxite Co. Ltd. (GBC), which was majority-owned by Alcan Inc. (80%) (formerly Alcan Aluminum Ltd. of Canada), operated the country's only bauxite mine at Awaso, which has been in production since 1941. GBC had the capacity to produce about 1 million metric tons per year (Mt/yr) of bauxite in the form of gibbsite that is marketed for chemical uses rather than for conversion to alumina. In 2003, Alcan reported purchases of 495,000 t of bauxite from GBC to be shipped to its specialty alumina plant at Vaudreuil, Canada, for treatment (Alcan Inc., 2004§). The inability of Ghana Railways Co. to handle more shipments for export was the major constraint on production for the year.

Gold.—Two major events dominated the gold sector in 2003—namely the announced merger of Ashanti Goldfields Co. Ltd. with AngloGold Ltd. of South Africa, which is 55% controlled by Anglo American plc, to form AngloGold Ashanti Ltd., and the announcement by Newmont Mining Corp. of the United States that they will make a significant investment in two new gold mines in Ghana; Newmont was the world's second leading gold mining company based on revenues following Anglo American,. Both developments will give a significant boost to the renewal of the gold industry in Ghana (Reuters, 2005§).

On December 12, AngloGold signed a Government Support Deed with the Government, and Ghana agreed to vote its 19% "golden share," along with Lonmin plc's 24.2% share in Ashanti, in support of the merger. On February 18, 2004, the Ghanaian Parliament approved the terms of a stability agreement, and the merger was completed on April 26, 2004. The new AngloGold Ashanti would become the world's second leading gold producer with a market capitalization of $11.3 billion and would employ 64,000 people worldwide. According to yearend 2003 data, the combined company will have worldwide proven and probable ore reserves of 2,610 t (83.8 million troy ounces) and an annual production capacity of 215 t (6.9 million troy ounces) of gold. The merger cost AngloGold about $1.4 billion in acquisition costs to acquire 87% of the new company; AngloGold also agreed to invest $220 million by December 2008 for cost-reduction efforts and new underground mining equipment, infrastructure, and environmental planning systems at the existing Obuasi Mine and to spend $44 million on exploration and a bankable feasibility study on the Obuasi Deeps deposit, which extends from 1,500 to 3,000 meters (m) below the existing mine, within 5 years. Assuming favorable economics, AngloGold anticipated that the capital cost during the life of the Obuasi Deeps Mine would be about $570 million and would extend the mine life from 2015 to 2040 or longer. Besides its capital, AngloGold brought its unique technical experience in deep gold mining in South Africa to the project, especially in shaft development, deep underground refrigeration, and rock mechanics. Under the terms of the stability agreement with the Government, Ghana agreed to fix the rates of certain taxes for projects of more than $500 million for a 15-year period; these included holding the gold royalty rate at 3% of total revenues, the corporate tax rate at 30%, and fixed rates

on other taxes, fees, and import duties. AngloGold Ashanti will also be allowed to hold between 60% and 80% of its earnings in offshore accounts (AngloGold Ltd. and Ashanti Goldfields Co. Ltd., 2004§).

During 2003, Newmont continued resource delineation and feasibility studies on its two main properties at Ahafo (formerly the Yamfo-Sefwi project) (100% owned), which is located about 60 kilometers (km) east of the border with Côte d'Ivoire in the Yamfo-Sefwi greenstone belt in west-central Ghana near Sunyani and Kenyasi, and at Akyem (85% owned), which is located 130 km northwest of Accra between New Abriem and Ntronang. In December, Newmont signed a foreign investment agreement with the Government that established fixed royalty and tax rates and currency regulations for the lives of Newmont projects in Ghana. Its corporate tax rate is set at 32.5%, and the gold royalty, at 3.6% for Akyem and 3% for Ahafo. The Government will receive a 10% free carried interest and had the right to acquire up to an additional 20% of project equity at fair market value after the 15th year of operation. Newmont will proceed with development of the Ahafo project and indicated an intent to develop Akyem after that. The capital cost to bring the Ahafo Mine into production will be $350 million with mining to begin by late 2005; first gold production was expected by mid-2006. The mine was expected to produce an average of 15,550 kilograms per year (kg/yr) of gold during a mine life of 15 years based on a reserve of 117.66 million metric tons (Mt) at a grade of 2.27 grams per metric tons (g/t) gold and a recovery rate of 89%. Newmont estimated that it will take an additional $245 million to develop the Akyem Mine; mine startup was planned for late 2006, and first gold production, by mid-2007. The Akyem Mine will produce an average of 12,440 kg/yr of gold during a mine life of 13 years based on a reserve of 87 Mt at a grade of 2.09 g/t gold and a recovery rate of 88.8% (Zisch, 2004§). Newmont reported additional indicated and inferred resources at Ahafo of 23.5 Mt at a grade of 1.76 g/t gold and at Akyem of 43.5 Mt at an average grade of 2.03 g/t gold, which it was working on converting to reserves during 2004 (Newmont Mining Corp., 2004§).

With recent mine closures and consolidation of the industry, two companies accounted for nearly 83% of gold production during 2003. Ashanti accounted for 43.9% of gold production from its Bibiani, Iduapriem/Teberebie, and Obuasi Mines, and Gold Fields (Ghana) Ltd. accounted for 38.8% of gold production from its Damang and Tarkwa Mines. Gold production, by company and mine from 1999 to 2003 is listed in table 3.

In 2003, Ashanti's corporate gold production from six mines in Ghana, Guinea, Tanzania, and Zimbabwe totaled 49,884 kilograms (kg), of which approximately 60.4% was from operations in Ghana compared with 59.5% in 2002. A 32% increase in production at the combined Iduapriem/Teberebie operation offset 12% and 4.5% declines in output at the Bibiani and the Obuasi Mines, respectively. The high production increase at the Iduapriem/Teberebie Mine was attributed to the completion of carbon-in-leach (CIL) plant-capacity upgrades. The potential for reserves in the Obuasi Deeps was being evaluated down to 3,000 m, which was some 1,500 m below the base of the existing mine infrastructure. For 2003, Ashanti treated 2.33 Mt of Obuasi underground ore at a grade of 7.04 g/t gold at the Sulphide Treatment Plant, which yielded 13,595 kg of gold; and 1.99 Mt of tailings at a grade of 2.2 g/t gold at the Tailings Retreatment Plant, which yielded 1,362 kg of gold. Ashanti processed 903,000 of ore at a grade of 1.87 g/t gold at the Oxide Treatment Plant from several small open pits at Adubrem, Homase, and Kunka and transition ores previously mined and stockpiled, which yielded 1,004 kg of gold (Ashanti Goldfields Co. Ltd., 2004§).

During 2003, production at the Bibiani Mine was affected by a major pit-wall slip at the main mine in November, which forced a suspension of mining. Three other satellite pits (Russell, Strauss, and Walsh) were being developed as sources of ore in 2004. At Bibiani, 3.1 Mt of ore at a grade of 3.09 g/t gold was mined, although technical problems limited mill throughput to 2.59 Mt of ore at a grade of 3.29 g/t gold and yielded 6,616 kg of gold during 2003. At the Bibiani Mine, development work advanced 1,200 m on an underground trackless decline designed to access deeper ore resources. Mining at the small Mpasetia deposit northeast of the Bibiani was being extended to 2004, as the result of the discovery of additional resources during 2003. At the Ashanti-controlled Iduapriem (80%)/Teberebie (90%) Mine, completion of the CIL plant allowed an increase in plant feed to 3.75 Mt at grade of 2 g/t gold in 2003 compared with 2.62 Mt at a grade of 1.96 g/t gold in 2002. Iduapriem/Teberebie production included 6,833 kg of gold from the CIL plant and 741 kg of gold from the Teberebie heap-leach operations (Ashanti Goldfields Co. Ltd., 2004§).

At the end of 2003, Ashanti reported total measured, indicated, and inferred resources of 117.1 Mt at a grade of 8.71 g/t at Obuasi; 29.3 Mt at a grade of 1.84 g/t, of which 5.3 Mt at a grade of 5.82 g/t was underground, at Bibiani; 105 Mt at a grade of 1.63 g/t at Teberebie; and 113.7 Mt at a grade of 1.19 g/t at Iduapriem. The total reported measured and indicated resource estimates, inclusive of reserves, were nearly 1,380 t (44.3 million troy ounces) of contained gold. As of December 31, 2003, reported total proved and probable ore reserves were 56.8 Mt at a grade of 6.19 g/t at Obuasi; 9.9 Mt at a grade of 1.94 g/t at Bibiani; and 54.6 Mt at a grade of 1.65 g/t at Teberebi/Iduapriem. The total reported proven and probable ore reserves were about 460 t (14.8 million ounces) of contained gold (Ashanti Goldfields Co. Ltd., 2004§). Obuasi Deep resources below 1,500 m, which were expected to exceed 10 g/t gold in grade, were not included in these estimates.

According to Gold Fields quarterly reports for calendar year 2003, the Tarkwa open pit and heap-leach operation processed 15.57 Mt of ore that yielded an average of 1.1 g/t gold and a total of 17,259 kg of gold compared with 16,283 kg of gold for calendar year 2002; increased tonnage made up for a slight 2% decrease in ore grade. At the Damang Mine in 2003, Gold Fields reported milling 5.08 Mt of ore at an average grade of approximately 1.9 g/t gold that yielded 9,420 kg of gold (Gold Fields Ltd., 2004a§). Gold Fields reported the following mineral resources and reserves as of June 30, 2004, based on a gold price of $400 per troy ounce for resources and $275 per troy ounce for reserves. At Tarkwa, resources were estimated to be 411.6 Mt at a grade of 1.5 g/t gold, of which reserves were 351.5 Mt at a grade of 1.3 g/t gold. At Damang, resources were 35.1 Mt at a grade of 1.6 g/t gold, of which reserves were reported to be 20.2 Mt at a grade of 1.3 g/t gold. Contained gold in the combined mines amounted to nearly 684 t (22 million troy ounces) of resources and 485 t (15.6 million troy ounces) of reserves (Gold Fields Ltd., 2004b§). At the Tarkwa Mine, Gold Fields began construction on a new 4.2 Mt/yr mill and carbon-in-leach (CIL) plant in 2003, which were scheduled for completion by the end of 2004. Capital spending for the company's 2003 and 2004 financial years amounted to $160 million. Investments included

a new mining fleet as the company transitions to owner mining from contract mining during 2004. At the Damang Mine, the feed blending to the milling circuits and the leach circuit's agitation system were adjusted to accommodate the shift to harder rock from soft saprolite as the pit deepens. New production from satellite pits at Amoanda, Rex, and Tomento were being commissioned for startup in late 2005 to help replace the decline in high-grade ores and the expected 20% drop in production from the main Damang pit in 2004 (Gold Fields Ltd., 2004c§).

During 2003, Golden Star Resources Ltd. of the United States operated the combined Bogosu/Prestea open pits and was preparing the Wassa open pit mine for reopening in 2004. Exploiting higher grade oxide ores at Prestea, Golden Star treated 2.1 Mt of ore at the Bogosu Mill at an average grade of 3.3 g/t gold, which yielded 5,422 kg of gold; this was a 40% increase compared with that of 2002. The flotation circuit at Bogosu was upgraded to prepare for the introduction of mixed oxide/sulfide and sulfide ores in 2004 and beyond. With the reopening of the Wassa Mine in 2004 and a 31% increase in Bogosu/Prestea gold reserves during 2003, Golden Star expected to increase production levels to 10,900 kg/yr of gold by 2005. To meet this target, a second processing plant will be built; the Bogosu plant will be converted to a bio oxidation (Biox) circuit to treat refractory sulfide ores, and the owner-operated mining fleet will be increased at both mines at a cost of $43 million. Following completion of a feasibility study in 2003, work began on construction of a conventional CIL processing plant to replace the old inefficient heap-leach dumps at Wassa. The $40 million capital project was expected to be completed during late 2004. Production for the first 12 months will come from the reprocessing of heap-leach material through the CIL plant where up to 1,710 kg of gold was expected to be recovered. Thereafter, by 2005, production from open pit mining will average 4,350 kg/yr of gold. Golden Star was also exploring a new higher grade deposit, which was located about 2 km southwest of the new Wassa plant. The company was also reevaluating the closed Prestea underground mine where inferred resources were reported to be 1.6 Mt at a grade of 8.58 g/t gold. The potential for recovering gold from unmined areas in the old Prestea Mine and for finding strike extensions of the three main quartz reefs was being explored. The company was actively exploring for additional surface mineralization at Bogosu and Prestea and on exploration licenses along the Akropong Trend and at Dunkwa/Mampong. As of December 31, 2003, total proven plus probable mineral reserves at Bogosu/Prestea were reported to be 27.3 Mt at a grade of 3.29 g/t gold and at Wassa, 16.2 Mt at a grade of 1.28 g/t gold. At Prestea/Bogosu, surface measured and indicated resources were reported to be 27.3 Mt at a grade of 2.5 g/t gold, and inferred resources, 29.7 Mt at a grade of 2.43 g/t gold; at Wassa, indicated resources were reported to be 9.4 Mt at a grade of 0.96 g/t gold, and inferred resources, 30.8 Mt at a grade of 1.27 g/t gold (Golden Star Resources Ltd., 2004§).

Akrokeri-Ashanti Gold Mines Inc. of Canada owned 85% of Bonte Gold Mining Ltd. and 90% of Goldenrae Mining Co.; both were Ghanaian subsidiaries. Following problems of low-grade ore, equipment unavailability, and a default of its financial obligations during 2003, Bonte was scheduled for liquidation in March 2004. Production for 2003 was reported to be 1,354 kg of gold and for the first 2 months of 2004, prior to closing, 158 kg of gold (Akrokeri-Ashanti Gold Mines, Inc. 2004a§; b§).

Chirano Gold Mining Ltd., which was owned by Red Back Mining NL of Australia (95%), was working on the development of the Chirano property, which was located adjacent to the GBC bauxite mine at Awaso. In November 2003, Red Back Mining NL signed a merger agreement with the Canadian junior Champion Resources Inc. The new company, Red Back Mining Inc. of Canada, will become a holding company for Red Back Mining NL and the Chirano Project. In February 2004, Champion Resources released the findings of its feasibility study on the project. The Chirano resource was estimated to be 22.1 Mt of measured and indicated resources at a grade of 2.1 g/t gold located in 14 separate gold deposits over a 14-km strike length and a probable reserve of 12.6 Mt at a grade of 2.3 g/t. Mineralization occurs in fractured and altered granites intruded along a shear zone between Proterozoic Birimian Formation mafic volcanic rocks and Tarkwaian Formation sediments. A capital cost of $44 million will cover the 15-month-long construction of the open pit mine, mill and CIL plant. The project was estimated to produce an average of 4,040 kg of gold during a 6.5-year mine life based on treating 2 Mt/yr of ore. Chirano also held exploration licenses on six other areas within Ghana (Red Back Mining Inc., 2004§; RSG Global, 2004§).

For the past several years, the Canadian joint venture of St. Jude Resources Ltd. and Fairstar Explorations Inc. has spent more than $20 million exploring the Hwini-Butre (49% interest) and the South Benso (90% interest) gold concessions. At Hwini-Butre in the Tarkwa District, the joint venture had reported a measured and indicated resource of 27,800 kg (829,000 troy ounces) of gold plus an inferred resource of 435 kg (14,000 troy ounces) of gold. A prefeasibility study on the economics of the deposit was expected by April 2005. At the adjacent Benso Concession, a measured and indicated resource of 15,100 kg (487,000 troy ounces) of gold plus an inferred resource of 340 kg (11,000 troy ounces) of gold had been identified (St. Jude Resources Ltd., 2004§).

In August 2003, Birim Goldfields Inc. sold its Mampong deposit, which is located near Dunkwa, with an estimated resource of approximately 31,000 kg (1 million troy ounces) of gold to Golden Star. Birim continued its exploration in the Bui District and planned additional drilling on gold mineralization discovered at the Tornbe North prospect in 2003 (Birim Goldfields Inc., 2004§).

Marine Mining Corp., which was a Canadian junior exploration company, held a 10,000-km^2 marine concession offshore for aggregate, industrial minerals, and precious metal exploration. The 240-km-long by 40-km-wide concession runs approximately from Winneba to just past Axim and covers the offshore extensions of the Ashanti and the Kibi-Winneba structural belts and their drainage systems. During 2002, Marine Mining received an Environmental Protection Agency permit to conduct offshore exploration operations and was preparing two land sites to receive and process samples. The company was seeking additional financing to pursue exploration and dredging operations (Marine Mining Inc., 2003§).

Manganese.—Ghana Manganese Company Limited's (GMC) Nsuta-Wassaw open pit near Tarkwa was the only producer of manganese ore in Ghana. Since 1996, the company has made significant investment in upgrading the mine equipment, the rail line from Nsuta to Takoradi, and the storage and loading facilities at the Port of Takoradi. As a result, production and, more importantly,

export capacity has increased to more than 1.5 Mt of manganese ore in 2003 from 260,000 t in 1996. Additional work at the Port of Takoradi was planned for 2004, which could allow for a further increase in manganese exports [Chronicle (Ghana), The, 2004§].

Industrial Minerals

Cement.—Ghana Cement Works Ltd., which was controlled by Heidelberg Zement AG of Germany (94.5%) and locally known as Ghacem, operated the country's only two clinker-grinding plants at the port cities of Takoradi and Tema. Each plant had the capacity to produce 1.2 Mt/yr of cement by using imported clinker, gypsum, and limestone. The mining industry accounted for about 10% of cement consumption, chiefly as a binder in gold heap-leach pads and CIL plants.

Diamond.—During 2003, more than two-thirds of total diamond production was recovered by artisanal miners from alluvial and in situ diamond deposits near Akwatia in the Birim Valley. Artisanal production was sold to the PMMC. The PMMC purchased 927,000 carats at an average value of $23 per carat in 2003 compared with 791,908 carats at an average value of $20 per carat in 2002 (Ghana Chamber of Mines, 2004). The only formal commercial production came from the Government-owned Ghana Consolidated Diamonds Ltd. (GCD), which was being offered for privatization by the Divestiture Implementation Committee of Ghana with completed bids due by September 30, 2003. Available reserves, which were distributed over a 240-km^2 area along the Birim River Valley, were estimated to be 14 million carats of proven reserves at an average grade of 1 carat per cubic meter, 4.6 million carats of probable reserves, and 30 million carats of possible reserves in addition to associated fine gold (Ghana Divestiture Implementation Committee, undated§). GCD was reportedly offered for sale to the British company Sappers and Associates; by early 2004, however, Sappers had not yet made the initial payments required by the sale agreement. Uncertainty over ownership was expected to reduce production during 2004 to 144,000 carats from a more-historical output of 600,000 carats per year (Ghanaweb, 2004a§).

To combat the illegal mining and smuggling of diamond, especially in Africa, the international community of approximately 50 diamond-producing and diamond-trading countries with support from the United Nations signed the Kimberley Process Certification Scheme agreement during 2003. By September, Ghana had failed to either ratify the Kimberley Process agreement or to put in place the required legislation to establish a certificate of origin system for diamond exports. As a result, the country was blacklisted from selling rough diamond in the international markets. In October, the Parliament finally passed the required legislation, which permitted Ghana to participate formally in the Kimberley Process and to market its diamond production (Ghanaweb, 2003a§, b§).

Salt.—In 2003, the Government introduced a special initiative on salt to try to promote new investment and jobs in the salt industry, which produced approximately 250,000 t/yr of salt, chiefly from salt water brine evaporation ponds. The Ministry of Mines was to assist in evaluating the development of the new salt industry in the Songhor Lagoon at Ada. The Ministry was obtaining consulting support from the United States and funding support from the Heavily Indebted Poor Countries Fund of the World Bank (Ghanaweb, 2004b§).

Other Industrial Minerals.—Carmeuse Lime Products (Ghana) Ltd., which was owned by Carmeuse S.A. of Belgium, operated out of Sekondi and produced limestone and lime, as well as seashells, which were supplied to Ashanti for use in its Biox gold-treatment plant at Obuasi. An estimated 20,000 to 30,000 people were involved in the small-scale production of industrial minerals, which included kaolin, limestone, salt, and sand and gravel.

Mineral Fuels

In 2003, GNPC produced an estimated 8,200 barrels per day (bbl/d) of crude oil from the Saltpond and the Tano oilfields and the first commercial production of natural gas from the North Tano Field. The U.S. Energy Information Administration (2003§) reported petroleum reserves to be 16.2 million barrels and natural gas reserves to be 23.8 billion cubic meters at yearend 2002. Ghana signed production agreements in August 2002 with First Oil Expro Ltd. of the United Kingdom for the development of its Tano (North and South) offshore oilfields and natural gas fields. By the end of 2003, North Tano, which was to be developed first, will supply 736 million cubic meters per day to Effasu, where a gas-processing plant will be built adjacent to the 134-megawatt (MW) power-generation barge. South Tano, which is located farther offshore in deeper water, will come onstream later. When onstream, gas deliveries will rise to 1.7 billion cubic meters per day, and generating capacity at Effasu/Mangyea was expected to increase to 270 MW. The South Tano field should also boost oil production from both fields to 3,000 bbl/d.

Saltpond Offshore Producing Ltd. (SOPL), which was owned by Lushann-Eternit Energy Limited of the United States (60%) and the GNPC (40%), began redevelopment of the Saltpond offshore oilfield and gasfield, which had been shut down since 1985. Redevelopment of Saltpond could include building a pipeline to take associated gas from the field to shore for domestic use. Dana Petroleum plc of the United Kingdom, which announced the discovery of a second well on the West Tano block on October 18, 2002, reported in-place reserves of 200 million barrels of oil. The crude oil is relatively viscous and recovery efficiencies were expected to be low. During 2003, Dana continued to drill several prospects in the deepwater portions of the West Tano block (Dana Petroleum plc, 2004§). Devon Energy Corp. of the United States and EnCana Corp. of Canada completed seismic work on the offshore Keta block during 2003 but was delaying drilling pending analysis of the seismic data. During 2003, Vanco Energy Co. of the United States completed a two-dimensional seismic survey of the Cape Three Points block and identified favorable structural traps that would justify a future three-dimensional seismic survey (Vanco Energy Company, 2003§).

After nearly 5 years of negotiations following approval of the project in 1999, construction of the West Africa Gas Pipeline (WAGP) was still being delayed. The $500 million WAPG Project will involve the construction of a 690-km-long offshore gas pipeline from the Niger Delta to the west coast city of Effuasi, Ghana, that will take Nigerian natural gas, which had been flared to

date, to help solve the long-term energy needs of the neighboring states of Benin, Ghana, and Togo. The pipeline, which will draw on Nigeria's more-than 4.5 trillion cubic meters of natural gas reserves, will supply an initial amount of 3.4 million cubic meters per day of gas to existing and planned powerplants in Benin, Ghana, and Togo. A private company, the West African Gas Pipeline Company Limited (WAGPCo), was formed to finance, construct, and operate the project. WAGPCo shareholders included ChevronTexaco Ltd. (41.87%), Nigerian National Petroleum Corporation (25.25%), Shell Overseas Holding Ltd. (18%), and the VRA (16.38%). WAGPCo was formed by the WAGP Consortium, which included Chevron Nigeria Ltd., GNPC, Nigerian National Petroleum Corporation, SA Société Béninoise de Gaz, Shell Petroleum Development Company, and Société Togolese de Gaz. In May 2003, WAGPCo signed the International Project Agreement that set out the commercial and regulatory structures applicable to the project with the Governments of Benin, Ghana, Nigeria, and Togo. Final investment decisions were still pending by yearend 2003, which could delay first gas deliveries until at least 2006 (ChevronTexaco Corp., 2003§). The World Bank had completed environmental impact assessments and resettlement plans; the extent to which local communities in the gas-producing areas of the Niger Delta, Nigeria, would benefit from the project, however, was still of concern (World Bank, 2004§).

Outlook

The gold industry continues to lead the minerals sector in Ghana and compensates somewhat for the closure of the Valco aluminum smelter in 2003. Following the introduction of the 1986 Mining Law and major exploration and investment during the 1990s, gold production increased to a peak production level of 80,000 kg of gold in 1999 from 16,800 kg/yr in 1990. The weak gold price and drop in risk exploration capital saw production drop to approximately 69,000 kg/yr from 2001 through 2003. Developments in 2003, which included the jump in world gold price to $350 per troy ounce and trending upward, are leading to a second major period of investment in the gold industry. Cumulative corporate proven and probable reserves, which amounted to nearly 1,600 t (51.4 million troy ounces) of gold, and measured, indicated, and inferred resources for the country, which amounted to 2,550 t (82 million troy ounces) of gold, will provide a solid foundation for new investment. With AngloGold investing $1.4 billion to acquire Ashanti during 2003 and 2004 and actual or planned capital investment by the top five gold companies active in Ghana of nearly $1.7 billion, gold production is expected to increase to the 100,000- to 103,000-kg/yr range between 2007 and 2010. Of this amount, $570 million is earmarked for the potential development of the Obuasi Deeps Mine, which, if feasibility studies are favorable, is likely to be in production by 2015, and will significantly extend the life of the Obuasi goldfield.

Recent reinvestment and rehabilitation of bauxite and manganese mining operations and the proposed privatization of the state diamond mining company suggested that the mining sector would be a significant component of the economy for at least the next decade. Although still in early development stages, the development of offshore natural gas resources and the completion of the WAGP will be key longer term factors in supplying the energy needed to support increased industrial development in Ghana and reducing dependency on high cost petroleum imports and the erratic weather-dependent hydroelectric power supply.

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TABLE 1
GHANA: PRODUCTION OF MINERAL COMMODITIES[1]

(Thousand metric tons unless otherwise specified)

Commodity[2]		1999	2000	2001	2002	2003
Aluminum:						
Bauxite, gross weight		355	504	678 r	684	495
Metal, smelter, primary		137	137 r	144 r	117	16
Arsenic, trioxide[3]	metric tons	7,000	-- e	--	--	--
Cement, hydraulic[4]		1,870	1,950	1,900	1,900	1,900
Diamond:						
Gem[e]	thousand carats	545	700 r	936 r	770	724
Industrial[e]	do.	137	178 r	234 r	193	180
Total[5]	do.	682	878 r	1,170 r	963	927
Gold[6]	kilograms	79,946	72,080	68,341	69,271	68,700
Manganese:						
Ore, processed		639	896	1,077 r	1,136	1,509
Mn content[e]		204	287	344 r	363	480
Natural gas	million cubic meters	--	--	--	--	112
Petroleum:						
Crude	thousand 42-gallon barrels	2,190	2,555 r	3,285	2,555	3,000 e
Refinery products:[e]						
Liquefied petroleum gas	do.	--	--	-- r, 7	625	625
Gasoline	do.	1,825	2,190	2,445 r, 7	5,850	5,850
Jet fuel	do.	365	730	511 r, 7	625	625
Kerosene	do.	730	365	767 r, 7	1,950	1,950
Distillate fuel oil	do.	2,190	2,555	2,628 r, 7	4,450	4,450
Residual fuel oil	do.	2,190	1,825	1,862 r, 7	1,250	1,250
Other including refinery fuel and losses	do.	730	730	767 r, 7	1,250	1,250
Total	do.	8,030	8,390	8,980 r, 7	16,000	16,000
Salt[e]		125 r	150 r	68 r	99	250
Silver, content of exported dore	kilograms	3,950 e	6,101 r	1,945 r	2,129	2,100 r
Steel, secondary, rebar[e]		75	75	75	75	75

[e]Estimated. [r]Revised. -- Zero.

[1]Table includes data available through October 2004.

[2]In addition to the commodities listed, a variety of crude construction materials (clays, sand and gravel, and stone) are produced, as are limestone and lime for the processing of some gold ore and salt. Output of these commodities is not reported and information is inadequate to make reliable estimates of output levels.

[3]Ashanti Goldfields Co. Obuasi roaster closed in June 2000.

[4]All from imported clinker.

[5]Production, in thousand carats, includes that of Akwatia Mine: 1999-205; 2000--233; 2001--300 (estimated); 2002--268, and 2003--240 (estimated). Remainder are artisanal sales to the Precious Metals Marketing Corporation. Estimates of unreported artisanal production are not included.

[6]Does not include estimate of smuggled or undocumented production.

[7]Reported figure.

Sources: Ghana Minerals Commission and company reports.

TABLE 2
GHANA: STRUCTURE OF THE MINERAL INDUSTRY IN 2003

Commodity		Major operating companies and major equity owners	Location of main facilities	Annual capacity
Aluminum	thousand metric tons	Volta Aluminum Co. Ltd. (Valco) (Kaiser Aluminum & Chemical Corp., 90%, and Reynolds Aluminum Co., 10%)	Aluminum smelter at Tema Closed in March 2003)	181.
Bauxite	do.	Ghana Bauxite Co. Ltd. (Alcan Aluminum Ltd., 80%, and Government, 20%)	Bauxite mine at Awaso	1,000.
Cement	do.	Ghana Cement Works Ltd. (Heidelberg Zement AG of Germany, 94.5%)	Clinker grinding plant at:	
			Takoradi	1,200.
			Tema	1,200.
Do.	do.	Diamond Cement Ghana Ltd.	Cement plant at Aflao uses imported clinker	600.
Diamond	thousand carats	Ghana Consolidated Diamonds Ltd. (Government, 100%)	Placer mine at Akwatia, in Birim Valley	360.
Do.	do.	Artisanal diamond miners	Birim Valley	500 to 900.
Gold	kilograms	Ashanti Goldfields Co. Ltd. [Depositary Nominee, Inc. (Ashanti), 36.1%; Lonmin, plc., United Kingdom, 31.5%; Government, 19%; other private, 13.4%]	Obuasi underground mine (surface mines closed mid-2000)	17,000.
Do.	do.	do.	Iduapriem/Teberebie Mine	8,800.
Do.	do.	do.	Bibiani Mine	7,000.
Do.	do.	Ashanti Goldfields Co. Ltd. total capacity in Ghana	NA.	32,800.
Do.	do.	Bogosu Gold Ltd. (Golden Star Resources Ltd., United States, 90%, and Government, 10%)	Bogosu/Prestea open pits. (Oxide ore until 2007, then sulfides. Prestea acquired 2001)	5,400.
Do.	do.	Wexford Goldfields Ltd. (Golden Star Resources, 90%, and Government, 10%)	Wassa Mine, 30 km northwest of Tarkwa (closed 2001; acquired by Golden Star Resources in 2002; reopening in 2004)	5,200.
Do.	do.	Bogosu Gold Ltd. (Golden Star Resources, 54%; Prestea Gold Resources Ltd., 36%; Government, 10%)	Prestea underground mine (acquired 2002; temporarily closed in early 2002)	1,100.
Do.	do.	Bonte Gold Mining Ltd. (Akrokeri-Ashanti Gold Mines Inc., Canada, 85%; Government, 10%; Buosiako Co. Ltd., Ghana, 5%)	Placer mine at Jeni River, about 40 kilometers southwest of Kumasi (Closed in early 2004)	2,000.
Do.	do.	Gold Fields Ghana Ltd. (Gold Fields Ltd., South Africa 71.1%; Repadre Capital Corp. of Canada, 18.9%; Govenment, 10%).	Tarkwa open pit mines and heap leach	17,000.
Do.	do.	do.	Damang Mine near Tarkwa	9,000.
Do.	do.	Newmont Mining Corp. (U.S.)	Ahafo (Yamfo-Sefwi) deposit, near Kenyasi (2006 startup)	14,800.
Do.	do.	do.	Ntotoroso deposit, near Kenyasi	NA.
Do.	do.	do.	Akyem deposit, west of Kibi (2007 startup)	12,500.
Do.	do.	Red Back Mining NL (Australia)	Chirano deposit, near Awaso (2005 startup)	4,510.[e]
Limestone and lime		Carmeuse Lime Products (Ghana) Ltd. (Carmeuse SA of Belgium)	Sekondi	NA.
Manganese ore	thousand metric tons	Ghana Manganese Company Limited (Government, minority interest)	Open pit mine at Nsuta-Wassaw, in Western Region	1,500
Salt	do.	Panbros Salt Industry Ltd.	Salt pan at Mendskrom, near Accra (2002 plans to expand to 200,000 t/yr)	200.
Do.	do.	Quality Salt Industry Ltd. (Closed in 1994, seeking new investors in 2002)	NA.	NA.
Do.	do.	Elmina Salt Producers Association	Artisanal salt pan mining near Elmina	NA.
Steel	do.	Ferro Fabrik Ltd.	Steel mill at Tema (secondary)	20 (rod, rebar, and wire).
Do.	do.	Tema Steel Co., [subsidiary of Ghana Industrial Holdings Co. (Government, 100%)]	do.	25 (rebar).
Do.	do.	Wahome Steel Ltd. (private Taiwanese investors, 95%, and Ghanaian investor, 5%)	do.	30 (rod, rebar, and wire).
Petroleum, crude	thousand barrels	Ghana National Petroleum Corp. (Government, 100%)	Saltpond and Tano Fields	3,500.
Petroleum products	do.	Tema Oil Refinery (Government, 100%)	Refinery at Tema	16,425.

[e]Estimated. NA Not available.

TABLE 3
GHANA: GOLD PRODUCTION BY COMPANY AND MINE

(Kilograms)

Company	Mine	1999	2000	2001	2002	2003
Ashanti Goldfields Co. Ltd.	Ayanfuri, open pit, depleted in 2001[1]	1,382	1,130	358	--	--
Do.	Bibiani	8,146	8,513	7,871	7,540	6,616
Do.	Iduapriem/Teberebie, open pits[2]	5,092 r	5,191	6,380	5,760	7,575
Do.	Asikam, alluvial (Midras Mining Ltd.)[3]	34	--	--	--	--
Do.	Obuasi, underground (open pit closed 2000)	23,113	19,937	16,437	16,709	15,961
Ashanti Goldfields Total		37,767	34,771	30,688	30,009	30,152
Golden Star Resources Ltd.	Prestea, underground and surface rights[4, 5]	894	--	--	--	--
Do.	Bogosu/Prestea, open pit	4,058 r	3,379	2,735	3,869	5,422
Do.	Wassa, open pit, closed 2002[6]	2,712 r	3,266	2,182	--	--
Golden Star Total after 2001		NA	NA	NA	3,869	5,422
Bonte Gold Mines Ltd.	Esaase and Jeni River, placers	1,515 r	2,134	2,031	1,432	1,354
Dunkwa Continental Goldfields Ltd.	Dunkwa, placer	1	--	--	--	--
Gold Fields (Ghana) Ltd.	Tarkwa, underground	1,269	--	--	--	--
Do.	Tarkwa, open pit, 1998 startup	6,806	11,272	16,392	16,283	17,259
Do.	Damang, open pit[7]	9,446	9,881	9,420	9,680	9,420
Gold Fields Total		NA	NA	NA	25,963	26,679
Precious Minerals Marketing Corp.[8]	Artisanal workings	2,302 r	1,968	1,446	4,880	5,093
Prestea Sankofa Gold Ltd.	Prestea Sankofa, tailings[9]	373	371	--	--	--
Resolute Amansie Ltd.	Obotan, open pit	4,230 r	4,199	3,447	--	--
Do.	Abore Mine (Operated 2002 only)	--	--	--	3,118	--
Teberebie Goldfields Ltd.[10]	Teberebie, open pit (See Ashanti Goldfields)	8,573	839	--	--	--
Grand total		79,946	72,080	68,341	69,271	68,700

rRevised. NA Not Available. -- Zero.

[1]Closed in early 2001.

[2]Includes production from Teberebie for 2001.

[3]Sold by Ashanti Goldfields Ltd. in 1999 and closed in 2000.

[4]Surface rights acquired by Golden Star Resources Ltd. from Barnex (Prestea) Ltd. (Western Areas Ltd. of South Africa) in 2001 to be used to extend life of the adjacent Bogosu Mine. Prestea Gold Resources Ltd. will retain rights to old Prestea underground mine.

[5]Acquired by Golden Star Resources Ltd. 70%, and Anvil Mining NL, 20%, in 1999. Golden Star acquired Anvil's 20% interest in 2001.

[6]Acquired by Golden Star from Glencar Mining plc. and Moydow Mines International Inc. in November 2001and placed on care and maintenance pending reappraisal.

[7]Acquired in January 2002 from Ranger Minerals Ltd. To be integrated into Tarkwa operation in 2003.

[8]Includes 8 to 110 kilograms per year of byproduct gold from Ghana Consolidated Diamonds Ltd.'s Akwatia Mine. Includes gold purchases from small-scale miners by other licensed buying authorities.

[9]Acquired by Ashanti in purchase of SAMAX, Inc. in 1998; sold in 1999. Included in Ashanti's total for 1998.

[10]Acquired by Ashanti (ore reserves) and Gold Fields (heap-leach facilities) from Pioneer Group Inc. in mid-2000.

Sources: Ghana Minerals Commission and Ghana Chamber of Mines, and company reports.